An Analysis Of The Port Potentials And Port Sites Of Brunswick And Glynn County

Prepared for the
City of Brunswick, Glynn County
and the
Brunswick Port Authority

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FOREWORD

This interim report is drawn from research entered into under an agreement by the Industrial Development Branch with the people of the City of Brunswick, Glynn County, and the Brunswick Ports Authority. It grows out of an urgent need for data required to make decisions concerning the development of Brunswick's general economic potentials. To fulfill this need we have given priority to the collection and analysis of facts pertaining to the immediate issues at hand. This report is thus intended to meet the dynamics of the rapidly evolving port requirements at Brunswick.

A proposition was adopted at the joint meeting in September of representatives of Brunswick, Glynn County, and the Brunswick Ports Authority and of the Industrial Development Branch. This proposition states that Brunswick can be made into a fine deep-water ocean port with facilities essential to such a port and with special consideration to the evolvement of a port oriented towards modern tanker and other super-cargo ships. The facts and arguments set forth in this report support this proposition and lay the foundation for a recommendation that this proposition be put into action.

In net, this report reviews the port potentials of Brunswick and Glynn County. Naturally, in so doing, a feasibility analysis of the possible sites for general and specific cargos is essential. For if the sites are deficient no amount of deep water is of value. At the present time, dock recommendations for petroleum cargo handling are excluded. Such review rightly fits into Phase I. Only general cargo requirements are

reviewed and this review is carried out at the level of "operations research," for neither funds, time, nor staff are available for a full dress analysis. Engineering details and specifications must be left to those specialized in these areas. The present recommendations are, however, so based on fact and analysis that they should serve adequately for a decision on the proposed construction of new port facilities at Brunswick by the Georgia Ports Authority and the State of Georgia.

This report would not have been possible without the efforts and support of a host of people. Rather than listing the many contributions in detail, we take this opportunity to extend to each and every individual our grateful thanks.

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SUMMARY AND CONCLUSIONS

Brunswick-Glynn County port potentials are among the best in the South Atlantic. A fine natural harbor and a location strategic to the Southeast and the Midwest, transportationwise, combine to make these potentials truly great. As the economic expansion of the Southeast and the Midwest continues apace, the general cargo that may be moved through the proposed Brunswick State Docks were adequate facilities provided, should be sizeable. By 1965, the tonnage should lie between 300,000 and 400,000 tons and, by 1970, between 440,000 and 640,000 tons a year.

These are relatively conservative estimates and the upper limits could be significantly higher, dependent of course upon the degree at which industrialization of the Southeast and the Midwest is intensified. Yet, these figures are large enough to warrant a recommendation that action be taken as soon as possible to construct docks and facilities.

Five sites in Brunswick and Glynn County have been evaluated: (1) Mansfield Street, (2) Quarantine Point, (3) Andrew's Island, (4) Colonel's Island, and (5) the section lying on Oglethorpe Bay between Third Avenue and the present Brunswick Port Authority property, herein referred to as the Fourth Avenue site, and now known as the Georgia Creosote Company property. Of these sites Fourth Avenue is recommended as the one port location now feasible, given the time and funds available. Of the others, only Colonel's Island is now feasible, but at a significantly higher cost than Fourth Avenue.

Under the restrictions surrounding the acquisition of property immediately adjacent to it, Mansfield Street cannot be made into a port of a size large enough to handle cargo efficiently and profitably. Quarantine

Point and Andrew's Island, because of stupendous fill-in requirements, cannot be developed immediately except at costs so excessive as to be prohibitive. They are better suited for long-run development. Colonel's Island is now too distant from the center of economic activity. Moreover, the approaches to it by land and sea would require additional investments of nearly a million dollars. As a long-run development, Colonel's Island is far better suited for industrial enterprise than it is for a port.

Thus, only the Fourth Avenue site remains. Fortunately, it can be developed at a reasonable cost, an amount less than $3,000,000. Its location on deep water, its proximity to highway and railroad, its soil condition, its relative closeness to industry, and its nearness to needed public utilities in general, all add to make it nearly the ideal port site. Moreover, it is large enough in area to permit the erection of an adequate transit shed, warehouse buildings, and properly aproned docks. Indeed, these facilities could be made among the best in the South Atlantic region. In time, furthermore, as port traffic increases with economic growth, expansion will not be limited. More land to the north of Fourth Avenue may be acquired for additional docks, facilities and storage space.

The Fourth Avenue docks would not only make a reality Brunswick's natural port potentials but would stimulate the growth of both the Brunswick-Glynn County economic area and the State of Georgia. In developing its port potentials Georgia can become a great transportation corridor for the Southeast and the Midwest to southern Europe, South America, the Mideast, and Africa. As it develops these potentials it will also develop its own industries to take advantage of the easy access thus afforded to markets westward and abroad.

I. The Contribution of New Port Facilities at Brunswick to Georgia's Economic Future

The growth of any economic region may be severely limited by the inefficiency of its transportation system, the highways, railroads and waterways. This principle has been accepted for so long that it has become an axiom. Experience after experience attests to it.

Georgia is no different from any other region in this respect. Its economic future is closely geared to the development of a good transportation system. Yet, while rail and highway services are being advanced, Georgia is lagging in providing full access to the best waterway system available, the Seven Seas. Georgia is favored by fine ocean port sites. But only one of these has been developed and that far from adequately. Brunswick offers a good approach to the sea -- better than most in some respects. The development of State Docks at Brunswick will help assure Georgia a share in that economic growth which is particularly affected by waterway transportation.

As manufacturing grows throughout the Southeast and the Midwest, many industries will be seeking efficient, low-cost outlets to the ocean. Georgia, through its ports, can be made a great corridor for the Southeast and the Midwest to southern Europe, South America, the Mideast, and Africa. All of these regions are themselves booming and require the many things made in the United States.

It is only a trick of fate that the development of this corridor has not taken place long ago. Atlanta is almost on the same meridian as Cincinnati and it is farther west than Detroit. Yet it is only 280 miles from the Atlantic, while Detroit, via the Mohawk and Hudson River valleys, is

725 miles away. Chicago is approximately the same distance from the sea via Atlanta and the Georgia ports as it is to New York via the Mohawk and Hudson River valleys. And by way of the St. Lawrence Seaway chicago is nearly 2,200 miles from the Atlantic. St. Louis is 1,051 miles to New York, but only 880 miles to the Atlantic by the way of Georgia ports.

The development of three trunkline railroads from the Midwest to Georgia, (1) the Atlantic Coast Line and Nashville, Chattanooga and St. Louis, (2) the Southern and Chicago Eastern Illinois and (3) the Frisco and Central of Georgia make the corridor to the sea a reality. These railroads are direct. They have neither high mountains to climb nor tortuous rivers to follow.

Overnight freight service from Atlanta to Chattanooga to the sea is alreay operating. Equally fast freight to St. Louis and Cincinnati are also not too distant possibilities.

Couple this railway service with a growing network of state and interstate highways, and the concept of Georgia as the great connecting link between the Atlantic and the Midcontinent is made all the more real. What is more, with growth of the Port of Bainbridge in South Georgia, the State also has an inland port which offers immediate access through water, highway and rail to the Gulf of Mexico. All of these developments strengthen Georgia's position as a major center of transportation in the United States.

The Savannah State Docks are gaining an international reputation for the efficient handling of cargo. The Georgia Ports Authority has succeeded far beyond expectations. Visitors come from the North and abroad to inspect its Savannah facilities. No one can deny the great contributions which the Authority has already made to the State's economic future. These facilities need to be expanded as soon as possible, as pointed out in an earlier study

made by the Industrial Development Branch.

By the same token strides towards developing Brunswick's port potentials should also be taken immediately. This proposition cannot be put too strongly. Brunswick's port potentials may be developed in such a way as to complement those of Savannah and still serve adequately the Brunswick-Glynn County area. Neither port is by itself large enough to provide the great bulkline distances found in the eastern ports. But together they may serve a vast region, efficiently and with dispatch.

While the precise time is not predictable, in the near future these Georgia ports will be required to handle increasingly large quantities of cargo, both general and bulk. For many cargos, the eastern ports are now virtually loaded to their peak capacity. It appears that it is only the lack of other ports with good cargo-handling facilities that keeps many ships from berthing elsewhere. The Mississippi-Ohio river system is reaching its limits of efficiency; a river system may be long but it is only "so wide." The tonnage is rising at such a phenomenal rate that passage is possible only with increasing losses of time. Indeed, the Corps of Army Engineers has become much concerned about the existing congestion there and it is looking into other river connections. But the final solution appears more likely to be found in the development of new Atlantic ports and adequate rail and highway connections to these ports. This solution should prove to be the most effective and economical of any.

The growth within the State of Georgia itself promises much for its ports. Moreover, should a refinery be located at Brunswick, there would be a substantial increase in general cargo originating out of the activities

of refinery satellites and the refining operations themselves.

Eventually, the Southeast should become a large scale producer of metal products. Many of these may be destined for foreign consumers. This growth would be stimulated greatly by the increasing use of minerals found in the Southeast and by the expanding importation of iron ore to be processed in Georgia on the coast. The iron so recovered would be shipped inland to such steel centers as Atlanta, Chattanooga, Columbus and Gadsden. There is even now a sizeable shortage of basic iron in this region.

Adequate dock facilities will in themselves help speed up the development of various industries. This proposition has been proved time and time again in other places but in similar settings. In the South the experiences of Mobile and Savannah support the proposition. The people of Brunswick and Glynn County are quite aware of the value of another port to their region, to the State of Georgia, and to the Southeast. For over a decade they have sought to have Brunswick re-established as a great port. Decades ago shipping through Brunswick reached truly sizeable proportions, and the people of Brunswick and Glynn County believe that an active port can once again be established there. There is much evidence to support this belief.

II. Potential State Dock Traffic for Brunswick

Presently, except for traffic bound for companies with private docking facilities, there is virtually no water-borne cargo handled through the Port of Brunswick. The reasons for this are fairly obvious. There are no public facilities for cargo handling from ship to shore. There is no covered storage area to serve as a transit shed, and little uncovered storage

space near the water-front. There are no longshore gangs to aid in cargo handling, no fork-lift or other cargo handling equipment of any sort and, as a result of these factors, no regularly scheduled service by any shipping companies. In net, there are no adequate public facilities available for handling general cargo or bulk shipments of cargo.

The need for public docks seems indisputable. And, since these docks would generally benefit the people of the State of Georgia, there is good reason for proposing the erection of such docks by the Georgia Ports Authority. The questions which remain are: (1) Can the Brunswick harbor accommodate modern freighters and (2) Is the expected tonnage enough to warrant the investment necessary to build a modern dock and the ancillary facilities?

First, Brunswick can now handle most modern vessels. At low tide, the channel into Brunswick River is 30 feet at its shallowest point. To be sure, the preponderance of information available indicates a trend toward increasing the draft on general cargo vessels, possibly to as much as 30 feet. This class of vessel is typified by the "Mariner" which will become increasingly important as a replacement for the Victory and Liberty class ships. At the present time, general cargo carriers can be typified by the C-2 and C-3 with drafts of 27 feet, seven inches and 28 feet, six inches respectively. If a minimum channel clearance of two feet (three feet may be a more desirable clearance) is prescribed it is evident that a channel depth of at least 30 to 31 feet is required.

Table 1 gives the range of drafts for fully laden general cargo vessels of some of the steamship companies which might be expected to operate in this area.

TABLE 1

DRAFTS OF GENERAL CARGO VESSELS
(In Feet)

Company	Feet
Alcoa Steamship Company	27.6 - 28.6
American President Lines	27.5 - 30.2
Bethlehem Steel	27.7 - 27.8
Colonial Steamship	27.8
Constable Hoop Shipyard	20.8
Eastern Seaways Corporation	27.8
Excelsior Steamship Corporation	27.8
Farrell Lines	25.7 - 29.1
Luckenback Steamships	28.6 - 32.8
Moore-McCormack Lines	27.7 - 29.2
United Fruit	25.3 - 27.7
U. S. Lines	27.6 - 32.8
Waterman Steamship Corporation	25.7 - 30.2

Source: Transportation Lines on Atlantic, Gulf and Pacific Coasts, 1956. Transportation Series 5, U. S. Army Corps of Engineers.

At high tide the Mariner and similar classes of vessels can be accommodated readily. Then, a channel depth of 36 feet to over 37 feet is available. Thus, the harbor is now capable of handling most modern general cargo ships.

The potential traffic depends of course upon a number of variables: the future development of the economic region immediate to the port, the future development of the more distant regions in the Southeast and the Midwest, and the competition from other ports in the South Atlantic States.

The growth of the Brunswick-Glynn County economic region may alone warrant the installation of adequate State Docks. Before the Second World War, even with the then existing primitive dock facilities, Brunswick moved over 100,000 tons of general cargo a year. Eventually, ships stopped making Brunswick a port of call because they could not be properly accommodated. But, since the 1939 Census of Manufacturers, the area's industrial

activity has grown beyond all expectations. Manufacturing employment in Glynn County alone jumped from 1,337 to 4,450 or nearly four-fold, from 1939 to 1956. Similar changes have taken place in a number of the counties west of Brunswick -- those that would have a particular need for ocean transportation. Wayne, Ware, and Lowndes counties may be cited. For the same period the value added by manufacture has increased in Glynn County from slightly less than $3,000,000 to $50,000,000, or sixteen-fold. Wayne, Ware and Lowndes counties have experienced similar gains over the same years.

A study of the effect of economic growth in the Southeast upon the ports of the region is useful in predicting the potential traffic at Brunswick. From 1947 through 1955 the average annual increases in traffic at the ports of Savannah and Jacksonville were 6.8 per cent and 8.7 per cent respectively. These gains are by no means insignificant and they are closely associated with the high rate of regional growth. They are borne out by increases in real per capita income of from 4 per cent to 8 per cent per year for the states comprising the Southeast.[1/]

Statistical analysis can provide estimates of port traffic for these South Atlantic ports: Wilmington, Savannah, Jacksonville, Port Everglades, and Miami. Charleston's traffic should be excluded because of a sizeable variation due to the stopping of coal shipments after 1947. From such estimation the potential cargo for Brunswick and other ports may be derived.

1/ See Ernst W. Swanson and John A. Griffin, Public Education in the South Today and Tomorrow, University of North Carolina Press, Chapel Hill, 1956, pp. 104-105.

First, total coastal and foreign shipments and receipts are correlated to the number of production workers in manufacturing in North Carolina, South Carolina, Georgia, and Florida. The State of South Carolina is included since it ships sizeable amounts through other ports as well as Charleston. The correlation shows that with an increase of one production worker there is an increase of cargo handled of approximately 485 tons per year.[1/] General economic analysis supports the assumption made here that this relationship will remain unchanged over the next decade or two.[2/] By 1965 an increase of 206,000 workers over 1954 is expected. Multiply this increase by the expected increase per worker in tonnage and the added cargo for these states amounts to 9,991,000 tons. By 1970 the increase will amount to 15,520,000 tons for the four states.

On the assumptions that Charleston is virtually rebuilding its port and will soon become competitive and that Brunswick is starting "from scratch," seven ports, the five above and Charleston and Brunswick, will share in these increases. If they were to share equally the additional tonnage acquired by each by 1965 would be 1,427,200 tons. By 1970 it would come to 2,217,000 tons.

As to the tonnage which the Brunswick State Docks themselves would receive, there are various possibilities. In light of the fact that some 70 to 75 per cent of the cargo estimates consists of petroleum products, general cargo, as a rule, might not run more than 25 to 30 per cent of total cargo

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1/ The estimating equation is $Y_c = -271.4 + 0.485X$, where X is thousands of production workers and Y_c is estimated cargo in 100,000 tons.

2/ See, for example, John L. Fulmer and Ernst W. Swanson, Georgia's New Frontiers, pp. 32-35, 42-43.

handled. (Petroleum products are best discharged through a T-pier.) If 25 per cent of the traffic is general cargo, if 20 per cent of this cargo is privately handled, and if the remaining 80 per cent is received at the Brunswick State Docks, by 1965 these docks should move 285,000 tons per year. The amount of cargo that would be moved by the docks in 1970 is estimated at 443,000 tons.

The reliability of these estimates can be checked by another correlation. For 1947 through 1955 the general cargo handled by the five South Atlantic ports mentioned earlier is related to Total Income Payments (current dollars) for North Carolina, Georgia, and Florida. Using the same correlation procedure of the previous analysis, the forecasts for increased general cargo in the South Atlantic ports are 3,510,000 tons in 1965 and 5,600,000 tons in 1970. Again, if these totals are allocated to the seven ports and if 20 per cent of the general cargo is handled privately, cargo received by the State Docks at Brunswick is estimated at 400,000 tons in 1965 and 640,000 tons in 1970.[1/]

These two sets of forecasts can be thought of as a range of potential traffic. By 1965, the Brunswick State Docks can expect to handle between 300,000 and 400,000 tons of general cargo, and, by 1970, between 440,000 and 640,000 tons. Inasmuch as the estimates of Total Income Payments and production workers upon which the forecasts rest are made conservatively, these estimates in turn are quite conservative.

The assumption of equal distribution of increased cargo among the seven ports is not necessarily a realistic one, however. Brunswick by

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1/ The estimating equation for this analysis is $Y_c = 2{,}655 + 6.52X$ where X is $100,000,000 of Total Income Payments and Y_c is 10,000 tons of general cargo. The coefficient of determination, adjusted for loss of degrees of freedom, is 0.906.

no means need settle for an equal share, since it would provide ocean shippers with modern facilities and an unusually accessible port. Its share could run significantly higher. As new manufacturing industries come to this area as a result of the port developments, they will add sizeable amounts to Brunswick's share of general cargo moving through South Atlantic ports. Vigorous action to present the advantage of the facilities to midwestern manufacturers may also add significantly to the exports through Brunswick.

Still another factor must be considered. Many of the old Atlantic ports are becoming more and more congested and the average turnaround time and the costs to shippers are increasing. The Port of New York, for example, had a total of 25,433 arrivals and departures during 1956 -- an average of one every 20 minutes. This number constitutes 22.6 per cent of all vessels arriving at or departing from principal United States ports. The reason for this concentration is probably the excellent reputation of this port for general cargo handling. There seems little doubt that shippers, caught in the increasing congestion of these old ports, would welcome new Atlantic ports if they offered comparable facilities. Inasmuch as Brunswick has an excellent natural harbor and excellent access to highway and rail transportation, there seems little doubt that a considerable portion of the increased cargo would be handled through the Port of Brunswick, were modern cargo-handling and storage facilities available.

If the present local attention to industrial development continues for some years and if industry in other parts of the country is made aware of the natural attractions of the Brunswick harbor, Glynn and nearby counties should experience a rapid increase in local industry. In turn this growth

will generate ever increasing quantities of traffic through the Port of Brunswick. (This attention must include careful planning for the development of suitable industrial areas.)

Particular consideration will naturally be given to the Port of Brunswick by companies which rely largely upon water transportation for raw materials and finished products. As a relatively small port facility is put into operation and as regular shipping schedules are established, based on the existing traffic which now appears available, then "water-transportation-oriented" industries will increase their interest in Brunswick. More and more of them will in all probability locate in the port area or in counties adjacent to it.

This expansion will create the need for additional port facilities and will generate still better port service. Thus it is that port development and industrial development, by their very nature, will expand and mature together, each assisting and complementing the other.

As the region and the State increase manufacturing, as seems likely for years to come, products for export to other countries may also be produced. Nations in the process of developing their own industrial economies, those in South America and Africa for example, will need large quantities of agricultural, electrical and other types of machinery; they will need finished iron and steel products of various sorts; and they will especially need transportation equipment. These are high-value-added products, the manufacture of which is even now rapidly increasing in the Southeast. Most of these items may be shipped by water.

Such are factors which make cargo estimates based on existing conditions too conservative. Their effects are not readily measured in quantitative terms but, when considered together with the estimates of additional traffic

discussed above, they substantiate the premise that the demand for handling general cargo in the next few years easily justifies the building of general cargo facilities at Brunswick.

III. The Evaluation of Possible Dock Sites

Before beginning an evaluation of specific sites the nature of dock facilities to be provided at Brunswick should be determined. It is clearly uneconomical to operate a port with less than two berths. In addition to the berths themselves provision needs to be made for those auxiliary facilities essential to an integrated port operation. These facilities include the following:

A. Dock and concrete apron 1,200 feet long by 75 feet wide,

B. Transit shed of 90,000 square feet floor area,

C. Approximately 180,000 square feet of paved area for truck access to transit shed and apron,

D. Approximately 200,000 square feet of open area storage space (approximately 5 acres),

E. Approximately 90,000 square feet of warehouse space,

F. Ready access of vessels to a channel at least 30 feet deep.

These facilities are made a primary consideration in the analysis of five dock sites situated in Brunswick and Glynn County. The feasibility of each site is now discussed in detail.

Mansfield Street Site

The availability of waterfront land at the foot of Mansfield Street at present is limited. The purchase of the area between Monk and George Streets and between Bay Street and the waterfront would make available an area

approximately 260 feet deep and 1,460 feet long, or about 8.5 acres. This is the bare minimum of land necessary to provide two berths, a transit shed, an open storage area, and access to transit shed and truck turnaround space.

The transit shed at the Mansfield Street site would be so small that it could accommodate cargo only from small vessels which have a maximum ship capacity of 8,750 tons and maximum length of 450 feet.[1/] To handle cargos from larger ships would require that the cargo be stacked so high that it would be crushed. Since most modern vessels have a capacity of at least 10,000 tons and a length of at least 450 feet, the ships which could be accommodated at this site would be limited.

As port traffic increases, motor vehicle congestion at the Mansfield Street site would rapidly become acute. Moreover, the cost of land in this vicinity, including the cost of relocating existing buildings, could be expected to be $100,000 per acre. This would make future expansion in this area extremely expensive. But, even with this outlay, adequate facilities could not be provided. The project depth in East River (Oglethorpe Bay) is now 27 feet. Although this will accommodate some of the vessels now carrying general cargo, it is doubtful that any of the large shipping companies would consider a regular port of call which does not have at low tide a 30-feet channel extending to the dock site.

From the standpoints of physical layout, accessibility, and efficiency, Mansfield Street must be ruled out as a dock site. From the long-run standpoint, however, its acquisition may be made a part of the plan for port

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1/ See Appendix 1 for method of computing transit shed cargo accommodation.

expansion. As will be developed later, this long-run plan calls for acquisition of the entire strip of land from Mansfield Street to the present Brunswick Port Authority's holdings at South End.

Quarantine Point Site

The Quarantine Point area is located east of the City of Brunswick and is in fact the lower part of the Marshes of Glynn. The report, The Port of Brunswick by Frederick R. Harris, Inc., (August 1945) recommended this location as one of three possible sites for industry. At that time neither the new U. S. 17 highway nor the Sidney Lanier Bridge had been built. Consequently, rail access to the area would have been relatively easy. Now, the expressway leading to the bridge is a costly barrier to rail service in that area. A grade crossing would not be suitable, and an adequate overpass would be very expensive. This site, however, has the advantage of being closest to the ocean and would not force ships to pass under the Sidney Lanier Bridge. The location or those parts of it where soil can bear manufacturing plants should be kept in mind as sites for industries requiring access only by truck.

From analyses of samples of the muck at several points in the Quarantine Point area it is evident that only a small portion could be used as plant sites. The cost of stabilizing the muck to a load-bearing capacity of at least 2,500 pounds per square foot would in all likelihood exceed $5,000 an acre.

The Quarantine Point site is not considered desirable for port development at the present time.

Andrew's Island Site

Andrew's Island, formerly known as Buzzards Island, is located across East River to the west of the City of Brunswick. The Island of approximately 1,050 acres consits of no naturally high ground. The spoil areas visible from Brunswick are covered with trees which give the impression that the land is firm enough to support buildings. It is most likely, however, that the spoil areas are islands floating in the muck and would sink if loaded heavily. An investigation carried out by Law-Barrow-Agee Laboratories, Inc., has indicated 20 feet of muck at points selected for borings.

A minimum area of fill-in might be chosen, however. Consider, for example, a development on the east side of the Island. This development would consist of a site of about 100 acres at the southeast end for port facilities and of a narrow strip 7,000 feet long and sufficiently wide to accommodate transportation approaches from the mainland. In all some 160 acres might be reclaimed as the first step in development.

The area under consideration amounts to approximately 2,300,000 square yards. As a rule when filling muck areas, two yards of fill are required for each yard of rise obtained. Therefore, it would be necessary to pump in 1,540,000 cubic yards of sand or other material to raise the average height of the area one foot. At a cost of 50 cents per cubic yard this would amount to $770,000 per foot of increase in the average height of the area if only fill material were used. To raise the level 10 feet the cost would be close to $7,700,000, which for the 160 acres would average $48,000 per acre. Even were fill-in possible at 20 cents a yard, the

cost would still be prohibitive. Moreover, the recommended practice, particularly in preparation of roadbeds and rail bases, is to remove the soft material down about 15 feet or to hard bottom. Fill material is then brought in. This procedure adds about 50 cents per cubic yard of muck removed.

Highway and rail access to the Andrew's Island site could be obtained from a crossing at the north end of East River. A swing or draw bridge would probably be required.

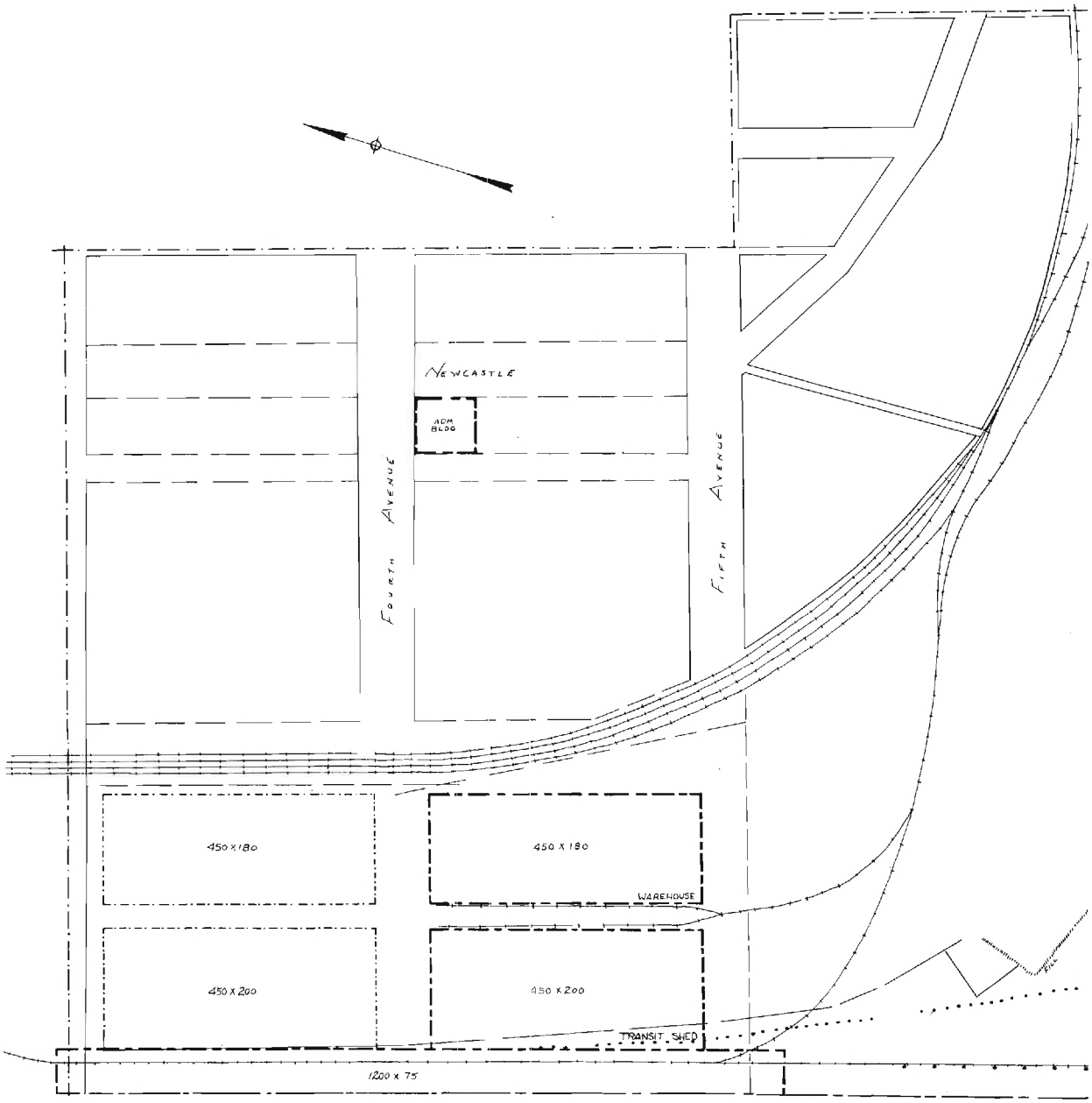
Thus the overall cost of developing the Andrew's Island site is now prohibitive.

Nonetheless, the site has long-run possibilities. If it were made a dumping ground for all dredging and other spoil, in time, the muck would be "sandwiched out" and replaced by solid material. The development cost in this case would tend to be considerably less.

Colonel's Island Site

The previous emphasis on sites for industrial development has been on areas close to the city and on areas that are now owned or may be acquired easily by local authorities. With the construction of the Sidney Lanier Bridge and U. S. 17 traversing Colonel's Island, this area is provided with easy highway access. The high land area of the Island extends to the water's edge. It has about a 2,000-foot shore line on South Brunswick River and would require little fill. A channel could be easily dredged to serve this area, since there is already a depth of 25 feet in several places within the limits of the proposed channel.

Map 1



FOURTH AVENUE PORT SITE

SCALE : 1" = 275'

LEGEND :

- SITE BOUNDARY
- STREETS CLOSED
- PROPOSED BUILDINGS
- PROJECTED BUILDINGS
- PROPOSED APRON
- PILINGS
- RAILROADS

Preliminary Design for State Dock at Fourth Avenue.

The wash along the bank of the South Brunswick River would tend to keep a channel clear once dredged. The same is true of Turtle River at its confluence with South Brunswick River. There is also a natural turning basin where the proposed channel from Colonel's Island would enter Turtle River.

Railroad connections to the Colonel's Island site would require approximately 14 miles of single track and the development of freight-car storage yards for port traffic. The land between the Colonel's Island site and the existing rail locations is generally high and is readily adapted to industrial use.

Colonel's Island offers long-run potentials. At present it is too distant from most industrial operations to be desirable as a port site. It is rather an excellent site for large industrial plants requiring water terminals and should be reserved for this use.

Fourth Avenue Site

The Fourth Avenue area offers by far the best site, given the present patterns of economic growth and the funds that may now be made available for a State Dock. Its one major deficiency is the limit upon growth resulting from its location, but this deficiency can be remedied by the acquisition of land lying northward along the East River. Indeed, a plan for such acquisition should be put into action as soon as possible. In this plan consideration should be given also to purchasing property east of the railroads to Grant Street and as far north as Gloucester Street. Except for the blocks containing the apartment buildings, this section is already zoned for light industry. Map I outlines the area planned for the

present State Docks. Given time, Brunswick should be able to develop the whole of the East River section into one of the best ports in the South Atlantic region.

For the time being, it is proposed that the State Dock facilities be located on a 33-acre plot including the area between Third Avenue and Fifth Avenue and between the waterfront and Richmond Street; and, in addition, the area between Fifth Avenue and the Atlantic Coast Line Railroad and Southern Railway tracks from the junction of the tracks and Fifth Avenue to Union Street. The property between Fifth and Third Avenues from the tracks westward to the waterfront is presently owned by the Union-Camp Bag and Paper Company. Some of the land described above is now owned by the City of Brunswick.

As it has been designed, the proposed port at Brunswick includes the immediate construction of a dock and apron 1,200 feet in length, one transit shed, one warehouse, an administration and office building, rail access to transit shed and warehouse, and some 10 to 15 acres of open storage and truck turnaround areas. In addition it includes expansion room for one additional transit shed and three additional warehouses. The facilities planned for immediate construction and those proposed for a later time should be able to serve the general cargo-handling needs of Brunswick for several years to come.

While this site does not meet the 100-acre size criterion held by some authorities, it is not cramped. There are compensating advantages which are not always found in port sites. One of these is the present excellent access by rail and highway. Two lines of the Atlantic Coast Line Railroad and one of the Southern Railway pass directly behind the warehouse which is planned for this site. Three tracks and sidings extend through the town

and provide adequate car storage space for the 50 to 60 cars needed to handle the tonnage of a general cargo berth. Fourth Avenue goes from the east side of the site directly into U. S. Highway 17, and indirectly to U. S. Highways 341 and 84. This means that large trucks can move to and from the port area in all directions without passing through the heavy traffic of Brunswick's business district. This site also lies on relatively direct routes to the major industrial sites planned for Brunswick and Glynn County.

The Fourth Avenue site is also served by electricity, water, sewage, and gas. A 44,000-volt line of the Georgia Power Company enters the site at two points.

The location of the site in the Brunswick harbor is almost ideal. Ships will lie well protected from winds and eddies. Deep-water berths can be prepared in a short time at only a small dredging cost. An excellent natural turnaround basin lies immediately westward of the proposed dock site.

The Fourth Avenue site is to the north of the present Brunswick Port Authority property. A contract has recently been negotiated with the Bestwall Gypsum Company for the lease of a part of this property to that company. A large plasterboard mill with ancillary operations is to be built by this company on the Port Authority property within the coming year and a half. The company will require a dock for the handling of gypsum rock to be shipped in from a mine in Nova Scotia.

The Brunswick Port Authority plans to build this dock and to lease it with storage yards for a long period of time. The dock apron will be designed and located in such a way as to join the State Docks apron. Thus

a total dock bulkline of 1,700 feet or more will be made available for handling ships. Through this fortunate joining of the two dock operations and sites, essentially three berths will be offered to large-vessel traffic of the Brunswick port. Substantial benefits should accrue to both parties from this joint venture. The sharing of railroad spurs, materials handling equipment, and certain operational costs are among the possible benefits.

To effect this arrangement, the people of Brunswick and Glynn County will have to acquire title to the Georgia Creosote Company property, since this property is best suited for the State Docks. It is the first step in the building of the State Docks. As such it, therefore, would bring to the Brunswick-Glynn County economic region a powerful stimulus to expansion. There is no doubt that the growth of this region has been retarded by the lack of adequate port facilities.

In net, by this investment the people of Brunswick and Glynn County acquire an excellent port for the least total investment. The dock facilities at Fourth Avenue would make possible highly efficient cargo handling, on a par with the best ports.

IV. A Preliminary Design of the Fourth Avenue Docks

Map I shows the dock designed for the Fourth Avenue site. As stated earlier, a 75 by 1,200-foot dock and apron, a transit shed, a warehouse, paved areas, an administration building, and a railroad spur and apron tracks are provided. The tracks on the aprons of the State Docks and the Bestwall Docks join together. All of the planned facilities for the port compare favorably with those of modern ports built elsewhere. The space on the apron is greater than average. The transit shed is 90,000 square

feet; the warehouse, 78,750. The administration building is 11,250 square feet. The paved area totals 19,000 square yards and affords plenty of room for handling cargo, and for operating cargo handling equipment and trucks.

Two railway entries into the State Docks are possible. The first would approach from immediately north of Third Avenue. The right of way for this entry would have to be acquired. The tracks would come in at an angle to the apron and run to the center of the yards between the transit shed and the warehouse. The apron tracks would continue on to the Bestwall Dock. The second entry is from the south by the way of the storage yards to be leased to Bestwall and the area between the transit shed and warehouse. The choice of entry will depend upon the circumstances.

The truck entrance to the docks would be by the way of Fourth Avenue. Since Fourth Avenue joins U. S. Highway 17 at a major intersection and also cuts across a major north and south street, this entry provides the best possible movement of truck traffic.

TABLE 2
COMPARISON OF PORT SITES FOR
GENERAL CARGO FACILITIES

	Mansfield Street	Colonel's Island	Fourth Avenue
Docks and Apron[1/]	$1,260,000	$1,260,000	$1,260,000
Dredging[2/]	100,000	287,000	28,500
Transit Shed[3/]	700,000	700,000	700,000
Handling Equipment[4/]	150,000	150,000	150,000
Paving Around Area[5/]	38,000	44,000	38,000
Access Road[6/]	--	23,000	--
Rail Tracks Service and Assembly[7/]	50,000	50,000	50,000
Access Railroad from Mainline[8/]	--	360,000	--
Culverts and Pilings for Railroad[9/]	--	50,000	--
Administration Building[10/]	--	90,000	90,000
Warehouse[11/]	--	275,000	275,000
Utilities[12/]	--	10,000	--
Fees, 15%	345,000	495,000	389,000
Total Cost (excluding cost of land)	$2,643,000	$3,794,000	$2,980,500

1/ Includes cost of dock and concrete apron 1,200 feet by 75 feet plus piling, bulkheads, etc., at $14.00 per sq. ft., for both sides.

2/ Estimated at $0.50 per cu. yd. including cost of disposal of waste material. South End would require dredging of estimated 57,000 cu. yds., and Colonel's Island, of 574,000 cu. yds. to provide accommodations for ships drawing up to 30 feet.

3/ Transit shed to be 200 ft. by 450 ft. at cost of about $7.75 per sq. ft., including sprinkler system and fireproofing.

4/ Estimated on basis of equipment required by other similar ports.

5/ Cost of estimated 22,000 sq. yds. paved area (asphalt on crushed rock base) at Colonel's Island and 19,000 sq. yds. at South End of area for truck access to warehouse and transit shed tract, at $2.00 per sq. yd.

6/ Seven-eighths of a mile asphalt paved road 21 feet in width at $2.00 per sq. yd. (applicable only to Colonel's Island).

7/ Includes approximately 10,600 feet of track on apron and to serve transit shed and warehouse and an equal amount of car storage track at $25,000 per mile.

8/ 14.3 miles of track from main track to port site at Colonel's Island at $25,000 per mile.

9/ Estimated.

10/ Cost of building 100 ft. by 100 ft. at cost of $9.00 per sq. ft., including air conditioning.

11/ 175 ft. by 450 ft. warehouse (78,750 sq. ft.) at $3.50 per sq. ft.

12/ Estimated cost of well, tower and pipes at Colonel's Island.

The comparative costs of the three sites which are now physically possible in the Brunswick harbor area are set forth in Table 2. The Colonel's Island dock facilities would be the most costly because of transportation requirements. The Mansfield Street site would be the least costly but would also have the lowest capacity and efficiency. The Fourth Avenue site, as designed here, would run around $2,980,000, exclusive of land acquisition. For this investment an excellent port would be obtained, a port that would be the envy of many states.

Appendix I

Computation of Cargo Density and Transit Shed or Warehouse Cargo Accommodation

1. A warehouse should, as a rule, be capable of holding at the same time an "in" cargo and an "out" cargo, or that portion of both which is not stored in freight cars or trucks.

2. The space occupied by cargos varies with the weight and size. Empirically, the average is around 40 cubic foot per ton.

3. Cargo density varies with the ship, its length, breadth, and depth and the kind of cargo. Density/foot may be derived empirically. H. J. Deane has derived such data; see Appendix Table I.

4. The procedure for deriving the storage capacities of a warehouse involves two computations:

   a. The derivation of the estimated cargo density for a ship per linear foot; and
   b. The estimation of the height of stacked cargo in a warehouse, given ship capabilities.

   Let D = estimated cargo density in warehouse storage for a ship/linear foot.
   d = average cargo density/foot, from Appendix Table I.
   w = average cubic feet of cargo/ton; here assumed to be 40 cu. ft./ton
   l = length of ship
   m = length of warehouse (inside)
   n = width of warehouse (inside)
   g = warehouse gangway width
   H = height of in and out cargo in a warehouse

   The cargo density for a ship is given by

   (1) $D = d \cdot w$; and

   (1a) $2D$ = cargo density for in and out cargos

   The height of the stacked cargo in a warehouse is:

   (2) $H = (2D \cdot l) \div ((m \cdot (n - g))$

   For the single cargo the equation is:

   (2a) $H_1 = (D \cdot l) \div ((m \cdot (n - g))$

5. Formulas (1) and (2) are applied to the ship parameters given in Table 1 and to the transit shed parameters designed for the Mansfield Street Docks, Brunswick. (Appendix Table 2 summarizes the computations and findings.)

6. The Mansfield Street site cannot handle ships over 450-feet long and over 8,750 tons capacity. The storage capacity sets these limits. Most general cargo cannot be stacked higher than 14 feet. It would be crushed by its own weight and, even if it were not, costly handling equipment would have to be adopted.

Appendix Table 1
SHIP CARGO DENSITIES

Length (Feet)	Breadth (Feet)	Depth (Feet)	Draft		Capacity (Tons)	Density/Foot (Tons)
			Feet	Inches		
250	37	18.50	16	7.50	1,387	5.55
330	45	24.50	20	9.50	3,885	11.77
410	53	30.50	24	11.75	7,357	17.94
490	61	36.50	27	11.00	11,986	24.46
570	69	42.75	31	7.00	18,358	32.31
650	76	48.50	34	--	23,000	35.38

Source: Adpated from H. V. Dean

Appendix Table 2
CUBIC FOOT PER TON OF CARGO

(1) Length of Ship (Feet)	(2) Ship's Capacity (Tons)	(3)	D (d.w)	(4) D1 (Cubic Feet)	(5) H (Feet)
250	1,387	2D	444.00	111,000	2.20
		D	222.00	55,500	1.10
330	3,885	2D	941.60	310,728	6.16
		D	470.80	155,364	3.08
410	7,357	2D	1,435.20	588,432	11.68
		D	717.60	294,216	5.84
490	11,986	2D	1,956.80	958,832	19.02
		D	978.40	479,416	9.51
570	18,358	2D	2,576.80	1,468,776	29.14
		D	1,288.40	734,388	14.57
650	23,000	2D	2,830.40	1,839,760	36.50
		D	1,415.20	919,880	18.25

Space computations for Mansfield Street Transit Shed:

$$((M \cdot (n - g)) = ((360 \cdot (160 - 20)) = 50,400$$